What is Claimed is:

1. A method for displaying graphical information indicative of a plurality of material characteristics for a portion of a part under test, the method comprising:

directing energy at the portion of the part under test;

detecting resultant energy from the portion of the part under test, the resultant energy formed by interaction of the directed energy with the portion of the part under test;

forming a plurality of graphs based upon the resultant energy, each of the graphs relating to a separate one of the plurality of material characteristics; and

displaying the plurality of graphs in a manner that facilitates substantially simultaneous visual comparisons between the information contained in each of the plurality of graphs.

2. The method of claim 1 wherein the step of displaying the graphs includes displaying the graphs on a single screen.

3. The method of claim 1 including generating raw data from the detected resultant energy from which each of the graphs is simultaneously formed.

4. The method of claim 1 wherein displaying the graphs includes displaying each of the plurality of graphs using a common resolution and includes aligning the graphs along a common axis to facilitate easy and accurate evaluation and comparison of the plurality of material characteristics.

5. The method of claim 1 wherein displaying the graph includes relating selected information in the graphs to color intensity so that variations in the color intensity are based upon variations in the selected information and displaying the selected information using the color intensities for highlighting variations and differences in the material characteristics.

6. The method of claim 1 wherein displaying the plurality of graphs includes displaying a three-dimensional graph and including selecting a two-dimensional portion of the three-dimensional graph for facilitating the evaluation of the material characteristic as a function of a position along an x-axis or y-axis of the graph.

7. The method of claim 1 wherein displaying the plurality of graphs includes displaying an isobar graph illustrating and highlighting differences and variations in the information included in the graph.

8. The method of claim 1 wherein the displaying of the graphs includes displaying selected ones of the graphs in real-time as the data therefor is obtained to allow for the efficient and timely evaluation of data by an operator as part testing occurs.

9. The method of claim 1 wherein obtaining the data includes obtaining the data for each of the graphs at different points in time and applying calculus operations and evaluation procedures on the data obtained at different points in time.

10. The method of claim 1 including obtaining data indicting a surface profile of the part under test for aiding in accurate positioning of a sensor.

11. The method of claim 1 including rotating or focusing on selected ones of the plurality of graphs simultaneously for aiding an operator in the evaluation of the material characteristics of the device under test.

12. The method of claim 1 wherein the step of detecting resulting energy includes detecting the diffraction or attenuation of the directed energy.

13. The method of claim 1 wherein directing energy includes directing x-ray or thermal energy at the selected portion of the part under test and detecting resultant energy includes detecting resultant x-ray or thermal energy from the selected portion of the part under test.

14. The method of claim 1 including selecting a point on a selected one of the plurality of graphs, generating a report of the material characteristics for the point, and displaying the report along with the graphs to facilitate evaluation of the material characteristics at the point.

15. The method of claim 14 including selecting the characteristics from a group comprised of: stress, stress error, intensity ratio, average peak breadth, average full width at half maximum (FWHM), shear stress, stress tensor, error tensor, x- direction stress, y-direction stress, maximum shear, equivalent stress, hardness, grain size, dislocation density, plastic strain, percent plastic strain, percent cold work, phases, percent retained austenite, strain, strain error, shear strain, strain tensor, x-direction strain, y-direction strain, and maximum strain.

16. The method of claim 1 wherein directing energy includes scanning the selected portion of the part under test from different directions to obtain accurate measurements of the material characteristics.

17. A method for measuring material characteristics for a portion of a part under test, the method comprising:

forming a plurality of formatted outputs, each output comprising a plurality of measurement values for a selected one of the plurality of material characteristics;

determining an evaluation guide that defines a relationship between at least two of the material characteristics based upon optimum guide values thereof;

selecting ones of the formatted outputs that correspond to the at least two material characteristics;

obtaining corresponding test measurement resultants from the selected formatted outputs;

comparing the test measurement resultants to the guide values; and

determining the need for a related action after comparing the test measurement resultants to the guide values.

18. The method of claim 17 wherein the step of determining an evaluation guide defines a threshold between two material characteristics and the step of determining the need for a related action includes determining where the test measurement resultants fall relative to the threshold relationship.

19. The method of claim 17 further comprising defining a zone about the evaluation guide and the step of determining the need for a related action includes determining whether the test measurement resultants fall within the zone.

20. The method of claim 17 wherein taking the related action includes an operator performing the action or performing an automated action.

21. The method of claim 17 wherein performing the automated action includes sending an alert concerning the quality of the part under test to an operator.

22. The method of claim 17 including displaying the formatted outputs in a manner that facilitates visual comparisons between and evaluation of the information contained in each of the formatted outputs.

23. The method of claim 17 wherein forming a plurality of outputs includes obtaining data representative of material characteristics by sensing diffraction characteristics and attenuated characteristics or both.

24. A method of monitoring material characteristics of a portion of a part under test, the method comprising:

obtaining data representative of a plurality of x-ray diffraction characteristics for a portion of the part under test;

forming a plurality of formatted outputs based upon the data, the formatted outputs each comprising a plurality of measurement values relating to one of the x-ray diffraction characteristics;

displaying the formatted outputs in a manner that facilitates visual comparisons between and evaluation of information contained in each of the formatted outputs;

determining a plurality of thresholds relating to at least two of the plurality of formatted outputs according to a predetermined relationship therebetween;

monitoring the measurement values within the at least two formatted outputs in real time;

comparing the monitored measurement values to the thresholds; and

determining the nature of an action to take as a result of comparing the monitored values to the thresholds.

25. The method of claim 24 wherein determining a plurality of thresholds includes determining a first threshold relating to a first formatted output and a second threshold relating to a second formatted output according to a first known relationship;

wherein monitoring the measurement values includes monitoring the measurement values of the first and second formatted outputs; and

wherein comparing the monitored values includes comparing the measurement values within the first and second formatted outputs to the first and second thresholds.

26. The method of claim 24 wherein determining the nature of the action includes taking the action only after at least one measurement value within the first formatted output reaches the first threshold and at least one measurement value within the second formatted output reaches the second threshold.

27. The method of claim 24 including:

displaying a third formatted output in a manner that facilitates visual comparisons between and evaluation of the information contained in each of the first, second, and third formatted outputs;

determining a third threshold relating to the characteristic of the third formatted output, the third threshold relating to the first and second characteristics according to a second known relationship;

monitoring the measurement values within the third formatted output; and

comparing the measurement values within the third formatted output to the third threshold.

28. The method of claim 27 wherein taking the action includes taking the action only after at least one measurement value within the first formatted output reaches the first threshold, at least one measurement value within the second formatted output reaches the second threshold, and at least one measurement value within the third formatted output reaches the third threshold.

29. The method of claim 28 including:

displaying a fourth formatted output in a manner that facilitates visual comparisons between and evaluation of the information contained in each of the first, second, third, and fourth formatted outputs;

determining a fourth threshold relating to the characteristic of the fourth formatted output, the fourth threshold relating to the first, second, and third characteristics according to a third known relationship; and

monitoring the measurement values within the fourth formatted output; and

comparing the measurement values within the fourth formatted output to the fourth threshold.

30. The method of claim 29 wherein determining the nature of the action includes taking the action only after at least one measurement value within the first formatted output reaches the first threshold, at least one measurement value within the second formatted output reaches the second threshold, at least one measurement value within the third formatted output reaches the third threshold, and at least one measurement value within the fourth formatted output reaches the fourth threshold.

31. A system for displaying graphical information indicative of a plurality of material characteristics for a portion of a part under test, the system comprising:

an energy emitter that directs energy at a selected portion of a part under test;

an energy detector that detects energy interacting with the selected portion of the part under test;

a controller configured to operate on data representative of the material characteristics generated from the detected energy for forming a plurality of graphs each associated with one of the material characteristics; and

a display on which the graphs are generated for viewing and analysis of the part under test.

32. The system of claim 31 wherein the display comprises a single screen on which the plurality of graphs are generated to allow a viewer to readily analyze and make comparisons and evaluations between the graphs of the material characteristics.

33. The system of claim 31 wherein the energy detector detects diffracted or attenuated energy from the selected portion of the part under test.

34. The system of claim 33 wherein the energy emitter directs x-rays at a selected portion of a part under test and the energy detector detects diffracted x-rays from the selected portion of the part under test.

35. The system of claim 31 which the controller includes an output coupled to the display such that the display simultaneously presents the plurality of graphs in a manner that facilitates visual comparisons between the information contained in each of the plurality of graphs.

36. The system of claim 31 wherein the characteristics are selected from a group including stress, stress error, intensity ratio, average peak breadth, average FWHM, shear stress, stress tensor, error tensor, principal stress, maximum shear, and equivalent stress, hardness, grain size, dislocation density, plastic strain, percent plastic strain, percent cold work, phases, percent retained austenite, strain, strain error, shear strain, strain tensor, x-direction strain, y-direction strain, and maximum strain.

37. The system of claim 31 wherein at least one of the plurality of graphs comprises a three-dimensional graph that shows a two-dimensional representation of the portion of the part from which measurements are taken and variations in the measurements for that portion.

38. The system of claim 31 wherein the controller includes controller means for transforming the data from memory into the plurality of graphs.

39. The system of claim 38 wherein at least one of the plurality of graphs is an isobar graph.